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BRIEF COMMUNICATION

EGGS AND INCUBATION IN THE AUSTRALIAN LIZARDS *AMPHIBOLURUS NOBBI* AND *EREMIASCINCUS RICHARDSONI*

Reproductive biology, particularly egg-laying, incubation and neonate sizes, is poorly known in Australian lizards[1]. Here I present data on these parameters in the Australian lizards *Amphibolurus nobbi coggeri* and *Eremiascincus richardsoni*.

Amphibolurus nobbi Witten, 1972 includes two subspecies[2], and all available ecological data relate to the nominate subspecies[3,4,5]. No studies have been conducted on *A. n. coggeri*, and in South Australia the species is poorly collected and little known[6]. The Desert Banded Skinks or Sandswimmers (*Eremiascincus* spp.) are distributed over most of arid and semi-arid Australia[7,8], and are abundant in suitable habitats. The biology of the genus is poorly known and accurate reproductive data are only available for oviparous *E. richardsoni* recording its clutch size[1,8]. The accuracy of the available information on *E. fasciolatus* is in doubt, having been reported as a viviparous species[1,8].

Since late 1987, my collections at Swan Reach Conservation Park, and those of Mark Hutchinson in Brookfield Conservation Park have included four gravid *A. nobbi coggeri* (Table 1) and one *Eremiascincus richardsoni*. After collection all females were placed in individual cages, furnished with a hide box and a nest box filled with moist sphagnum moss. Fresh water was available, and a climbing branch provided. Lizards were offered various insects and feeding often occurred until the day before oviposition.

The eggs were marked and measured, with vernier calipers, to the nearest 0.1 mm (Table 2) and were placed on a medium of vermiculite and rainwater (50:50 by weight), in a small plastic container, with 12 small holes drilled into the lid to allow for air exchange. The first two clutches of *A. n. coggeri* eggs were incubated at room temperature (20-34°C). The others, and the *E. richardsoni* eggs, were incubated in a temperature controlled (27-31°C) snake cage. The eggs were checked daily, and the medium sprayed, as necessary, with rainwater that was the same temperature.

Each *A. n. coggeri* laid a clutch of 5-7 eggs (24.xi.1987-10.i.1991) (Table 1). Female SVL and clutch size were not significantly correlated ($r = 0.8465$, $0.1 > P > 0.05$). The nest boxes were not used; all eggs were laid on the floor of the cage. The female *E. richardsoni* (SAM R37015, SVL 90 mm) laid four eggs in the afternoon of 18.xii.1990. These eggs were laid in the sphagnum moss, and each adhered to one other egg in the clutch.

Five *A. n. coggeri* eggs from the second clutch were slightly collapsed and pear shaped (vs. oval) upon laying, and went mouldy during the first week of incubation. These eggs were opened, prior to disposal, to establish fertility. All were infertile. The *A. n. coggeri* eggs maintained in the more controlled environment were more successful in both hatching rate, and a shorter incubation period. All eggs incubated by this method, successfully hatched after $\bar{x} = 47.25 \pm 2.71$ (44-50) days, whereas the eggs in the uncontrolled conditions took $\bar{x} = 62.57 \pm 2.71$ (56-73 days), and two embryos were dead or severely deformed.

On the 27.xii.1990 it was apparent that only two of the *E. richardsoni* eggs (nos. 2 and 3) were fertile. They had increased in size, had a pinkish tinge and blood-vessels were

TABLE 1. *Source and clutch sizes for gravid female* Amphibolurus nobbi coggeri.

Female No.	SVL	Locality	Date Collected	Date Laid	Clutch Size	SAM Reg. No.
1	80	Swan Reach CP	9.x.1987	24.xi.1987	7	—
2	84	Swan Reach CP	9.x.1987	28.xi.1987	7	—
3	74	Swan Reach CP	18.xi.1989	10.i.1990	5	R36316
4	80	Brookfield CP	1.xii.1990	12.xii.1990	5*	R36997
5	69	Ti Tree Well	8.xii.1977		4	R16587

* Two of these eggs were laid in the bag following collection. When discovered they were not viable and were discarded.

TABLE 2. *Egg and neonate sizes in* Eremiascincus richardsoni *and* Amphibolurus nobbi coggeri *expressed as $\bar{x} \pm SD$ if appropriate with range in parenthesis.*

Species	Egg Sizes: Length	Egg Sizes: Width	Neonate Sizes: SVL	Neonate Sizes: TL
E. richardsoni	18.58 (16.5 - 19.5)	9.95 (9.9 - 10.1)	32.5 (31 - 34)	78.5 (77 - 80)
A. n. coggeri	16.0 ± 1.49 (12.1 - 18.3)	9.12 ± 0.3 (8.7 - 9.6)	28.53 ± 0.74 (27 - 30)	80.67 ± 2.97 (76 - 87)

forming on the inside walls. Eggs 1 and 4 had not changed in size or colour, and were thought to be infertile. Measurements of the eggs could not be taken at this stage due to the adherence and shape of the mass. After 36 days incubation, on 23.i.1991 the shell on egg no. 2 had split. This was noticed at 1935 hr, but the lizard did not emerge until 0315 hr the next morning. The shell on egg no. 3 was split at 2020 hr on 23.i.1991 and full emergence occurred at 0922 hr the next day, after 13 hours in the open egg shell. The other two eggs (1 and 4) were mouldy, and were opened before discarding, to confirm them to be infertile. Too few eggs were available to permit opening an egg to determine at what stage of embryonic development this species lays its eggs. The incubation period shown here is similar to that for *Ctenotus taeniolatus*[9], a similar sized skink, whose eggs were laid at stage 30[10]. All neonates were measured at hatching (Table 2).

Most of the *A. n. coggeri* neonates were released at the collection site of their respective parents. The deformed specimen and four neonates were placed in the South Australian Museum (SAM R35843-44, 36318-19 and 37951). The *E. richardsoni* neonates were maintained.

To supplement the observations reported here, specimens held in the South Australian Museum were examined for gravid females. Greer examined all specimens of *Eremiascincus* in State Museum collections prior to 1979[8], therefore only specimens of *Eremiascincus* registered after that year were examined.

Only one specimen of *A. n. coggeri* (R 16587) had oviducal eggs (Table 1). The largest egg in this specimen (16.8 × 8.2 mm) suggests that these eggs were near oviposition. The only data for clutch sizes in *A. nobbi* are related to the nominate subspecies (3-4)[3], which has a smaller clutch size than reported here for *A. n. coggeri* (4-7). This suggests a correlation between female size and clutch size, as *A. n. coggeri* is larger than the nominate race[2]. The clutch size reported here for *A. n. coggeri* is, however, similar to those reported for *A. muricatus* and *A. norrisi* (3-8 and 3-7 respectively)[1], *A. nobbi*'s closest relatives[1,11], and both these species are reported to be larger than *A. n. coggeri* (75 vs 100 and 110 mm SVL respectively)[7].

No further specimens of gravid *E. richardsoni* were found, but two *E. fasciolatus* (R30948 and R36137) were found with well-developed oviducal eggs (5 and 3 respectively). These eggs were surrounded by a thin shell membrane, the appearance of which suggests that the eggs would have been voided.

The egg-laying reported here confirms observations on oviparity in *E. richardsoni*[1,8], and the findings from dissected Museum specimens supports the suggestion that previous reports of viviparity in *E. fasciolatus* may be in error.

The S.A. National Parks & Wildlife Service provided collecting permits. Dr Mark Hutchinson collected two of the specimens on which these observations were made, allowed me to examine Museum specimens and read drafts of the manuscript. Adrienne Edwards provided data for Museum specimens and Brian Miller assisted with weighing the neonates. David Langdon and Ed McAlister read the final drafts of the manuscript, which was typed by Judy Woolman.

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